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EXAMINER

NADAV, O

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 12/14/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/139,935

Applicant(s)

Hshieh

Examiner

ORI NADAV

Group Art Unit

2811



☒ Responsive to communication(s) filed on Aug 25, 1998

☐ This action is FINAL.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-32 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-19 and 21-31 is/are rejected.

☒ Claim(s) 20 and 32 is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 2

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 13 recites the limitation "said low resistance trenches" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

4. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Uenishi et al. (5,894,149).

Uenishi et al. teach in figure 1 the entire claimed structure including a semiconductor structure comprising: a substrate 1 having a major surface, at least one trench in the substrate includes inner

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surfaces filled with conductive material 8 electrically separated from the substrate by insulating material 7, a first insulating layer 7 disposed on the major surface above the trench and having a first contact opening, a first conductive layer 8 disposed above the first insulating layer 7 and in contact with the conductive material in the trench through the first contact opening, a second insulating layer 19 disposed above the first conductive layer and having a second contact opening, and a second conductive layer 10 disposed above the second insulating layer 19 and in contact with the substrate through the second contact opening.

5. Claims 1-3 and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Kubo et al. (5,972,741).

Kubo et al. teach in figure 1 the entire claimed structure including a semiconductor structure comprising: a substrate having a major surface, at least one trench in the substrate includes inner surfaces filled with conductive material 4 comprising polysilicon, electrically separated from the substrate by insulating material 3, a first insulating layer 3 disposed on the major surface above the trench and having a first contact opening, a first conductive layer 4 disposed above the first insulating layer 7 and in contact with the conductive material in the trench through the first contact opening, a second insulating layer 6 disposed above the first conductive layer and having a second contact opening, and a second conductive layer 7 disposed above the second insulating layer 6 and in contact with the substrate through the second contact opening, a source layer 5, a drain 1 and a gate 3 includes the trench.

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Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-12, 14-19 and 21-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uenishi et al. or Kubo et al. in view of Blanchard (5,034,785).

Uenishi et al. and Kubo et al. teach substantially the entire claimed structure, as applied to claim 1 above, except trenches formed in first and second directions.

Blanchard teaches in figure 9 trenches formed in first and second directions. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form trenches in first and second directions in Uenishi et al. and Kubo et al.'s device, because the layout of a circuit is a matter of design choice within ordinary skill in the art, subject to routine experimentation and optimization to find the most efficient layout for the circuit.

Regarding claims 4, 24 and 30, Uenishi et al. and Kubo et al. teach second conductive layer being substantially rectangular in shape and having no elongated voids extended therein.

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Regarding claims 5, 6, 25 and 29, Uenishi et al. teach a first insulating layer comprising silicon dioxide and a second insulating layer comprising BPSG (column 19, lines 36-37 and column 15, line 17).

Regarding claims 7-12, 19, 22, 23, 26, 29 and 31, Uenishi et al. teach conductive layer comprising metal (column 11, line 51) and Kubo et al. teach a gate material inside the trench comprising polysilicon. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use metal comprising aluminum or copper, and a gate material comprising polysilicon in Uenishi et al. and Kubo et al.'s device, because aluminum, copper and polysilicon are conventionally used in the art for gate electrodes and conductive layers.

Regarding claims 2, 3, 17, 18 and 28, Kubo et al. and Uenishi et al. teach a source layer, a drain and a gate inside the trench.

Regarding claim 14, the trench is elongated in shape.

Allowable Subject Matter

8. Claims 20 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(703) 308-8138**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

Ori Nadav

December 10, 1999

STEVEN H. LOKE
PRIMARY EXAMINER
GROUP 2800

Steven Loke